REMARKS

In the Office Action dated April 24, 2008, the Examiner rejects claims 1-19. Specifically, the Examiner makes the following rejections:

A. 35 U.S.C. § 102(b)
   1. Claims 1, 2, 4, 6, 8-10 and 13 as being anticipated by Nagasubramanian et al. (US Pat. No. 5,599,355).
   2. Claims 17-19 as being anticipated by Kejha (US Pat. No. 6,080,511).
   3. Claims 1, 2, 5, 6, 8-10, 12, 14 and 15 as being anticipated by Hong et al. (WO 03/065481).

B. 35 U.S.C. §103(a)
   1. Claims 3 and 7as being unpatentable over Nagasubramanian et al. in view of Munshi (US Pat. No. 6,645,675).
   2. Claims 5, 12, 14 and 15 as being unpatentable over Nagasubramanian et al. in view of Hong et al.
   3. Claim 16 as being unpatentable over Nagasubramanian et al. in view of Hong et al. as applied to claim 15 and in further view of Triplett (US Pat. No. 3,566, 985).
   4. Claim 11 as being unpatentable over Nagasubramanian et al. in view of Speakman (WO 99/19900).
   5. Claims 3 and 7 as being unpatentable over Hong et al. in view of Munshi.
   6. Claims 4 and 13 as being unpatentable over Hong et al. in view of Nagasubramanian et al.
   7. Claim 11 as being unpatentable over Hong et al. in view of Speakman.
   8. Claim 16 as being unpatentable over Hong et al. in view of Triplett.

With this Amendment, Applicants have amended claims 1-13 and 15-17 and have added new dependent claims 20-29. Independent claims 1, 10 and 15-17 have been amended to clarify the existing elements of the claims without making substantive amendments, and therefore should not necessitate a new ground of rejection. After entry of this Amendment, claims 1-29 are pending in the Application.

Rejections under 35 U.S.C. §102(b)

The Examiner rejects claims 1, 2, 4, 6, 8-10 and 13 under 35 U.S.C. §102(b) as being anticipated by Nagasubramanian et al. Applicants respectfully submit that claim 1 as

amended recites a lithium ion battery comprising a cathode, an anode and an electrolyte layer constituting a cell element. The electrolyte layer comprises an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces. Nagasubramanian et al. fails to teach or suggest an electrolyte layer comprising an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces.

Nagasubramanian et al. teaches a salt deposited on inorganic particles, creating a uniform suspension of coated inorganic particles. (Col. 5, ll. 9-11). Salt coated on an inorganic particle is inherently smaller than the particle on which it is deposited. The individual insulating particles and the electrolyte occupying the interstitial spaces are nearly the same size as described by Applicants. (¶ [0040]). The individual insulating particles are arranged as shown in Figs. 5B, D, E and Figs. 6A-C. Electrolyte of nearly the same size is arranged in some of the interstitial spaces. Arranging individual insulating particles cannot be accomplished by the method of making a solution taught in Nagasubramanian et al.

Because Nagasubramanian et al. does not teach or suggest each of the limitations of claim 1, claim 1 is allowable over Nagasubramanian. Because claims 2, 4, 6, 8 and 9 depend from claim 1 either directly or indirectly, claims 2, 4, 6, 8 and 9 are also allowable over Nagasubramanian et al.

The Examiner rejects claims 10 and 13 under 35 U.S.C. §102(b) as being anticipated by Nagasubramanian et al. Applicants respectfully submit that claim 10 as amended recites a method for manufacturing a battery comprising applying individual insulating particles and an electrolytic polymer to form an electrolyte layer, wherein the electrolytic polymer occupies at least some of a plurality of interstitial spaces between the individual insulating particles. Nagasubramanian et al. fails to teach or suggest a method capable of applying an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces.

Nagasubramanian et al. teaches forming a suspension of salt and inorganic particles and casting the suspension into a film. Forming a suspension and casting cannot accomplish the placement of individual insulating particles as disclosed by Applicant. By placement using a print application method by which patterning application is possible, especially an ink-jet method, easy placement to form the electrolyte layer is possible even in a microscopic, complex array. For example, microparticulated insulating particles, as well as the electrolyte, can be placed easily at any position one-dimensionally (linearly), two-dimensionally (flatly) or even three-dimensionally (stereoscopically), even in a microscopic, complex array to form the electrolyte layer or insulating particle layer. (¶¶ [0060], [0061]). Because this arrangement cannot be achieved by Nagasubramanian et al., it does not teach or suggest the method of claim 10 and its dependent claim 13. Applicant respectfully submits that claims 10 and 13 are in condition for allowance.

Claims 17-19 are rejected under 35 U.S.C. §102(b) as being anticipated by Kejha. Applicants respectfully submit that claim 17 as amended recites a method of manufacturing a lithium ion battery comprising applying individual insulating particles on a substrate with a first coating means and applying an electrolytic polymer in at least some of a plurality of interstitial spaces and between the individual insulating particles with a second coating means to form an electrolyte layer. Kejha fails to teach or suggest a method of manufacturing that achieves the application of individual insulating particles and subsequently applying electrolyte within some of the interstitial spaces.

Kejha teaches a polymeric electrolyte composite including an electrically nonconductive woven or non-woven glass fiber net dip coated with polymeric material such as PEO. (Col. 3, ll. 1-8). The Examiner contends that the fiber net is equivalent to the insulating particles and the dip coating is equivalent to our coating means. A fiber net is not equivalent to individual insulating particles. Furthermore, dip coating is not a coating means equivalent to the coating means disclosed in Applicants' specification – ink jet, spray coating, screen printing, etc. (¶ 0080). Dip coating will not achieve the thin layer and the individual placement achieved by

the methods disclosed.

Because Kejha does not teach or suggest each of the limitations of claim 17, claim 17 and its dependent claims 18 and 19 are allowable over Kejha.

The Examiner rejects claims 1, 2, 5, 6, 8-10, 12, 14 and 15 under 35 U.S.C. § 102(b) as being anticipated by Hong et al. Applicants respectfully submit that claim 1 as amended recites a lithium ion battery comprising a cathode, an anode and an electrolyte layer constituting a cell element. The electrolyte layer comprises an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces. Claim 10 as amended recites a method of making a battery comprising applying individual insulating particles and an electrolytic polymer to form an electrolyte layer, wherein the electrolytic polymer occupies at least some of a plurality of interstitial spaces between the individual insulating particles. Claim 15 as amended recites a battery assembly comprising multiple connected batteries, wherein lithium ions can be inserted into and removed from the cathode and the anode through the electrolyte layer, and wherein the electrolyte layer comprises individual insulating particles and electrolytes occupy at least some of a plurality of interstitial spaces between the individual insulating particles. Hong et al. fails to teach or suggest a cell element consisting of the electrolyte layer, cathode and anode with the electrolyte layer comprising individual insulating particles and electrolytes occupying at least some of a plurality of interstitial spaces between the individual insulating particles.

Hong et al. teaches the use of a woven separation membrane that is impregnated with the electrolyte solution. The separation membrane is provided on the surface of a supporting body. (Pg. 13, ll. 22-26 and FIG. 3). The Examiner contends that the separation membrane is equivalent to the electrolyte layer in claim 1 with the inorganic filler being the insulating particles. However, Applicants' individual insulating particles with the electrolyte in interstitial spaces can be used in place of a separator to support and separate the anode and cathode. "The structure of the invention is one in which insulating particles **4** *a* as a separator substitute material are placed in the electrolyte layer **4** between the anode and cathode, and

electrolytes **4** *b* are held in at least some of the interstitial spaces, preferably substantially all of the interstitial spaces, between the insulating particles. As a result, the insulating particles **4** *a* function as a separator, maintaining the gap between the electrodes so that the facing anode **2** and cathode **3** do not come into contact." (¶[0037]). Claim 1 clearly states that the electrolyte layer, cathode and anode constitute a cell element, thereby excluding a separation membrane. Furthermore, a woven separation membrane is not equivalent to individual insulating particles recited in each of claims 1, 10 and 15. As to claim 10, the claimed method of Hong et al. recites forming a polymer membrane onto a supporting body of a polymer separation membrane. The polymer layer is compressed on the woven separation membrane. (Pg. 17, ll. 3-4). Applicants' method applies individual insulating particles and an electrolytic polymer in an arranged electrolyte layer.

Because Hong et al. does not teach or suggest each of the limitations of claims 1, 10 and 15, each of these claims and their respective dependent claims 2, 5, 6, 8, 9, 12 and 14 are therefore allowable.

Rejections under 35 U.S.C. §103(a)

The Examiner rejects claims 3 and 7 under 35 U.S.C. §103(a) as being unpatentable over Nagasubramanian et al. in view of Munshi and as being unpatentable over Hong et al. in view of Munshi. Nagasubramanian et al. and Hong et al. are discussed above with respect to claim 1, upon which claims 3 and 7 depend. Munshi discloses methods of making a solid polymer electrolyte including stamping the polymer/salt/filler/ionic conductor mixture onto a substrate. In certain other methods, the process of making a solid polymer electrolyte includes adding a liquid organic solvent to the mixture, and evaporating the liquid organic solvent prior to optionally curing of the solid polymer electrolyte. In some of these solvent-based casting or coating methods, the process of forming the mixture into a solid polymer electrolyte may include employment of any of a variety of methods, including knife coaters, doctor blade coaters, wire-wound bar coaters (Mayer rods), air knife (air doctor) coaters, squeeze roll (kiss coaters), gravure

coaters, reverse roll coaters, cast film coaters and transfer roll coaters. (Col. 9, ll. 9-24). As the Examiner states, inorganic filler is dispersed with lithium ions; however, the solution is applied with one of the methods listed above. Applying a solution with any one of the methods listed does not achieve applying individual insulating particles and electrolyte, as disclosed in claim 1, from which claims 3 and 7 depend. Accordingly, combining Munshi with either Nagasubramanian et al. or Hong et al. fails to teach or suggest all the features of claim 1 and its dependent claims, including claims 3 and 7.

Applicants submit that Nagasubramanian et al., Munshi and Hong et al., either alone or in combination, fail to teach, suggest or render obvious an electrolyte layer comprising an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces. Claims 3 and 7 are in condition for allowance.

The Examiner rejects claims 5, 12, 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over Nagasubramanian et al. in view of Hong et al., and claims 4 and 13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Hong et al. in view of Nagasubramanian et al. As argued above, neither Nagasubramanian et al. nor Hong et al., either alone or in combination, teach, suggest or render obvious an electrolyte layer comprising an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces, as recited in claims 1, 10 and 15. For these reasons, claims 4 and 5, which depend from claim 1, claims 12-14, which depend from claim 10, and claim 15 are in condition for allowance.

The Examiner rejects claim 16 under 35 U.S.C. § 103(a) as being unpatentable over Nagasubramanian et al. in view as Hong et al. as applied to claim 15 and in further view of Triplett, and as being unpatentable over Hong et al. in view of Triplett. Triplett is cited for the electric vehicle driven by an electric motor powered by a DC battery having a plurality of cells. However, as argued above, neither Nagasubramanian et al. nor Hong, alone or in combination, teach, suggest or render obvious an electrolyte layer comprising an arrangement of individual

insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces, as recited in claim 15, from which claim 16 depends. Triplett fails in combination with these two references fails to cure this deficiency as Triplett also fails to teach or suggest such an electrolyte layer. Applicants therefore respectfully submit that claim 16 is in allowable form.

The Examiner rejects claim 11 under 35 U.S.C. §103(a) as being unpatentable over Nagasubramanian et al. in view of Speakman and as being unpatentable over Hong et al. in view of Speakman. Speakman is cited for the use of ink jet printing in applications such as catalysts and electrodes. Speakman discloses the use of ink jet "for rechargeable electronically active smart cards for banks, theatres, airports, train/bus stations, conventions and conferences. Such cards will also house a mini display so that the card holder can access data independent of the end use interrogation equipment. . . . Typical dimensions are battery height less than or equal to 2 mm, diameter less than or equal to 20 mm. Recharge cycles have been shown to be as high as 1,000 times." (Pg. 18, ll. 1-11). There is no discussion of using ink jets to manufacture batteries to power vehicles. As argued above, neither Nagasubramanian et al. nor Hong, alone or in combination, teach, suggest or render obvious an electrolyte layer comprising an arrangement of individual insulating particles with a plurality of interstitial spaces therebetween, with electrolytes occupying at least some of the interstitial spaces as recited in claim 10, from which claim 11 depends. Combining Speakman with these two references fails to cure this deficiency since Speakman also does not teach or suggest such an electrolyte layer. Applicants therefore respectfully submit that claim 11 is in allowable form.

New claims

Applicants have added new claims 20-29. Claims 20, 22, 24, 26 and 28 depend respectively from claims 1, 10, 15, 16 and 17 and add the feature wherein the arrangement of individual insulating particles is a patterned arrangement. Claims 21, 23, 25, 27 and 29 depend respectively from claims 20, 22, 24, 26 and 28 and add the feature wherein the patterned

arrangement is at least one of alternating rows of the individual insulating particles and the electrolyte, circles of the individual insulating particles and the electrolyte, columns formed by the adjacent individual insulating particles linearly connected with each other, a lattice-like arrangement, and columns formed by the adjacent insulating particles connected with each other in a zigzag. These features are described in paragraphs [0040] to [0044] and are shown in FIGS. 5B, 5D and 6A-C of the instant application. None of the cited references, either alone or in combination. teach or suggest a patterned arrangement as claimed.

Conclusion

It is submitted that this Amendment has antecedent basis in the application as originally filed, including the specification, claims and drawings, and that this Amendment does not add any new subject matter to the application. Reconsideration of the application as amended is requested. It is respectfully submitted that this Amendment places the application in suitable condition for allowance; notice of which is requested.

If the Examiner feels that prosecution of the present application can be expedited by way of an Examiner's amendment, the Examiner is invited to contact undersigned at the telephone number listed below.

Respectfully submitted,

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